

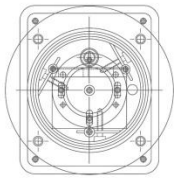


PKL Technologies Inc.
pkltechnologies.com

SPECTRA-1 User Manual

Rev. D Update 2 2012





About This Manual

Document Purpose and Intended Audience

This document provides the user of **Spectra-1** portable gas analyzer with instructions for setting up and performing industrial and environmental open path real-time measurements of select gases. **Spectra-1** is a compact weather resistant design, suitable for open path, ambient air, and fence line monitoring applications.

Document Summary

Chapter	Description
Chapter 1: User Information/Warranty	Contains descriptive information about Spectra-1 open path laser based gas detection instrument. Warranty description.
Chapter 2: Set-up and operation	Provides set-up and installation instructions. System configuration and user settings overview.
Chapter 3: Troubleshooting	Contains recommended steps to isolate and correct common problems.
Chapter 4: Specifications	Contains technical specifications and connector pinouts for Spectra-1 .



Chapter 1

User Information

Caution – use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Class 1 Laser Product

Spectra-1 contains no user serviceable components. All service work to be performed by PKL Technologies Inc. personnel only. Return **Spectra-1** to PKL Technologies Inc. for any service or repair work. **Spectra-1** is not to be opened or modified in any way – broken seal will void warranty.

Do not operate Spectra-1 if the unit is not complete or seal is broken.

No scheduled maintenance required for continued Class 1 compliance.

Please refer to Chapter 2 for proper instrument set up and operation – failure to do so may cause instrument damage or inaccurate data reported.

This Laser Product is designated as Class 1 during all procedures of operation.

Spectra-1 Serial Number:

Wavelength: nm

Laser Power for classification: <10 mW

Beam Diameter: <20mm at aperture

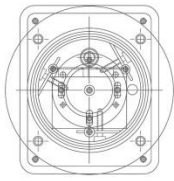
Divergence: >1.5 mrad

Transverse Beam Mode: TEM00

Emissions: Continuous Wave

Tested By:

Test date:



Spectra-1 User Interface (Rear Panel View)

Spotting scope:

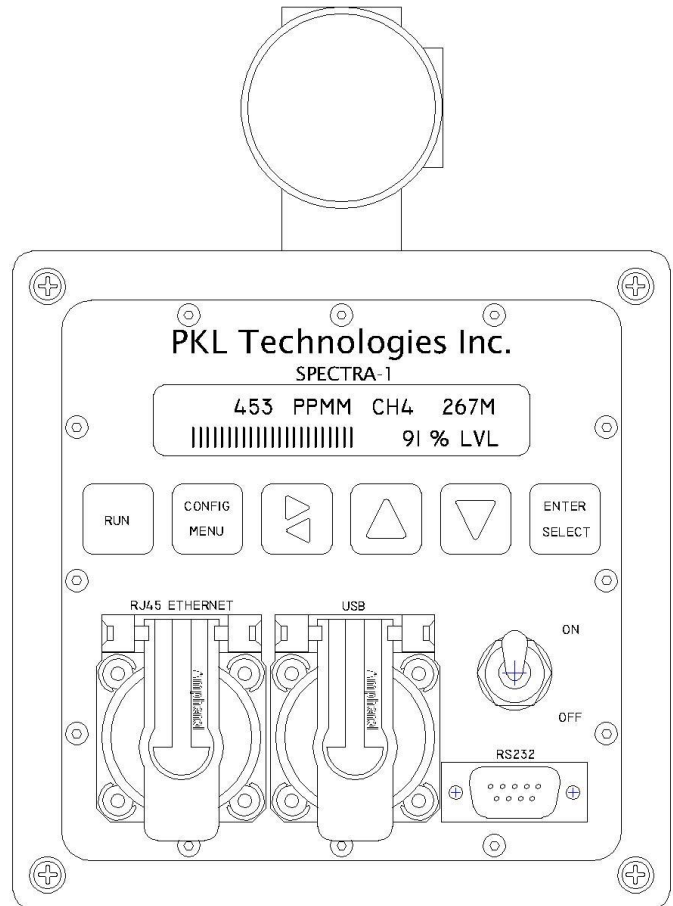
- Spectra-1 alignment with retro-reflector

2 X 20 character LCD display:

- gas concentration
- ppm or ppm-m
- distance to retro-reflector
- signal level bar graph
- signal level % reading
- configuration/menu display

Keypad for system configuration:

- distance to retro-reflector
- gas concentration - ppm or ppm-m
- averaging time 1 to 999 seconds
- maximum signal level set (i.e. 95%)
- minimum signal level set (i.e. 2%)
- RS232 com port setting (baud rate)
- logging options
- logged data transfer – USB memory stick
- calibration settings
- Spectra-1 settings output
- display IP address



RJ45 Ethernet weatherproof connector (used by manufacturer only)

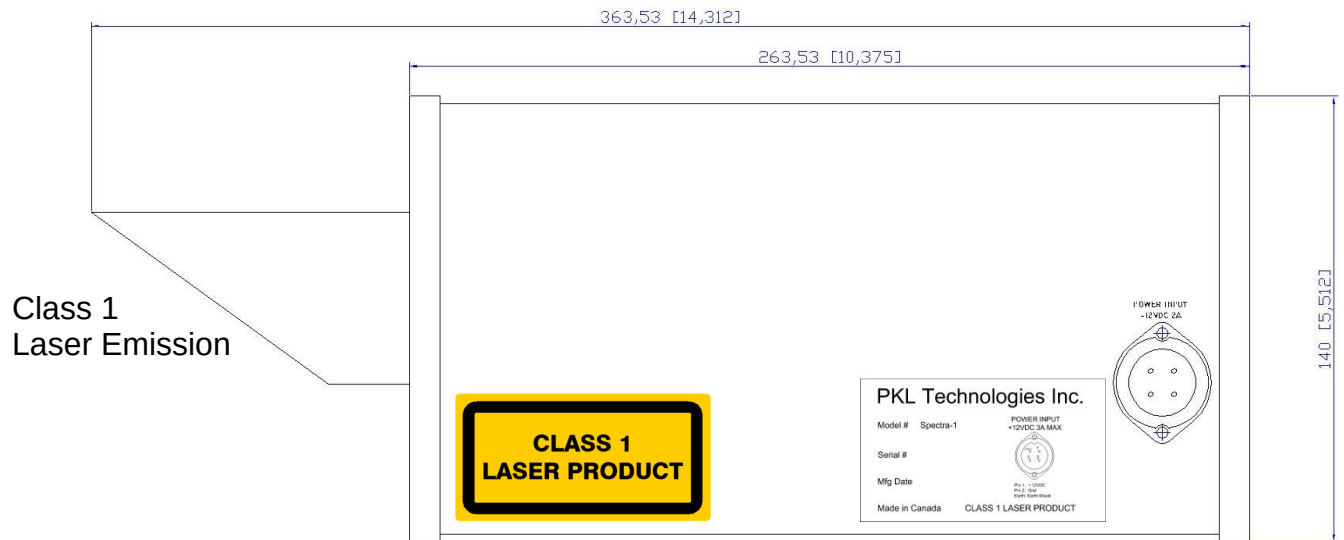
USB weatherproof connector (logged data downloading)

Sealed on/off power switch

Sealed RS232 com port (serial data out)

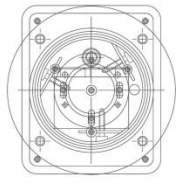


Spectra-1 Side View - product label placement



Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007





Warranty

PKL Technologies Inc. hereby represents and warrants all Products manufactured by PKL Technologies Inc. to be free from defects in workmanship or material during a period of twelve (12) months from the date of delivery. If any Product proves however to be defective in workmanship or material within the period herein provided PKL Technologies Inc. undertakes to the exclusion of any other remedy to repair or at its own option replace the defective Product or part thereof free of charge and otherwise on the same conditions as for the original Product or part without extension to original warranty time. Defective parts replaced in accordance with this clause shall be placed at the disposal of PKL Technologies Inc.

PKL Technologies Inc. also warrants the quality of all repair and service works performed by its employees to products sold by it. In case the repair or service works should appear inadequate or faulty and should this cause malfunction or nonfunction of the product to which the service was performed PKL Technologies Inc. shall at its free option either repair or have repaired or replace the product in question. The working hours used by employees of PKL Technologies Inc. for such repair or replacement shall be free of charge to the client. This service warranty shall be valid for a period of six (6) months from the date the service measures were completed.

The warranty is however subject to the following conditions:

a) A substantiated written claim as to any alleged defects shall have been received by PKL Technologies Inc. within thirty (30) days after the defect or fault became known.

This warranty does not however apply when the defect has been caused through:

- a) Normal wear and tear or accident.
- b) Misuse or other unsuitable or unauthorized use of the Product or negligence or error in storing, maintaining or in handling the Product or any equipment thereof.
- c) Wrong installation or assembly or failure to service the Product or otherwise follow PKL Technologies Inc. service instructions including any repairs or installation or assembly or service made by unauthorized personnel not approved by PKL Technologies Inc. or replacements with parts not manufactured or supplied by PKL Technologies Inc.
- d) Modifications or changes of the Product as well as adding to it without PKL Technologies Inc. prior authorization.
- e) Other factors depending on the Customer or a third party.

Notwithstanding the aforesaid PKL Technologies Inc. liability under this clause shall not apply to any defects arising out of materials, designs or instructions provided by the Customer.

This warranty is expressly in lieu of and excludes all other conditions, warranties and liabilities, express or implied, whether under law, statute or otherwise.



Chapter 2

Set-up and Operation

Selecting Location

Spectra-1 is an open-path gas sensing instrument. A clear line of sight between Spectra-1 and the retro-reflector is required. The sensing path may be as short as 1 meter, or as long as 1000 meters. The retro-reflector requirements will vary with the path length. For short paths (up to 20 meters), Reflexite may be used. This retro-reflective tape is very useful, but has a limited range due to the reflected field of view. For long path applications hollow retro-reflectors are used. Please consult with PKL Technologies Inc. support for recommendations.

Retro-reflector Positioning

Both tripod mounting and permanent mounting of the retro-reflector (single and multiple), require simple alignment with Spectra-1. Position the retro-reflector facing Spectra-1 with as little tilt as possible, both horizontally and vertically. This will ensure highest returned signal strength.

Spectra-1 Positioning

Spectra-1 is placed on a tripod with an adjustable mount, or on a permanent mounting location also with an adjustable mount. The adjustable mount is used to aim Spectra-1. By looking through the alignment scope one centers the remote retro-reflector, using the fine adjustments on the mount. After the retro-reflector is centered, small adjustments may be required to adjust to the desired signal level. This will be done after Spectra-1 is powered up.

Note: At short path lengths the scope will center above the reflective element (Reflexite)



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Spectra-1 placed on tripod with adjustable mount. Retro-reflector is in background. Path length minimized for this photo.



Spectra-1 Start-up

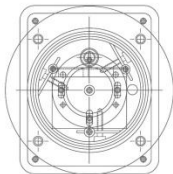


Connect supplied power cable to Spectra-1, and to a +12VDC source. A 12 volt battery pack may be used, or a 12 volt DC power supply capable of > 3 Amps.

Power switch is turned on. Spectra-1 will display:

PKL TECHNOLOGIES INC
SPECTRA-1 BOOTING

This will be displayed during internal computer boot-up – approximately 2 minutes.



After Spectra-1 booting period display reads:

SPECTRA-1 Warm up

After warm up period display reads:
This takes as long as the data averaging
period setting. (1 second +)

Starting...

After warm up, display will read no data
available, if not in alignment with retro-
reflector.

HF 250M
No data available

Proper alignment with the retro-reflector
will produce the following normal operational
display output.

78.35PPM HF 250M
LVL 31%

Signal Level (LVL) should fall between 10% and 75% for best operation.

Configuration Menu – Spectra-1 Options

Press CONFIG/MENU key to enter Spectra-1 options.

Use the arrow keys ▲▼ to select the menu item you wish to change. (Scrolling menu)

Press the ENTER/SELECT key to make change. After making a change press the
ENTER/SELECT key. Press the RUN key to return to normal Spectra-1 operation.

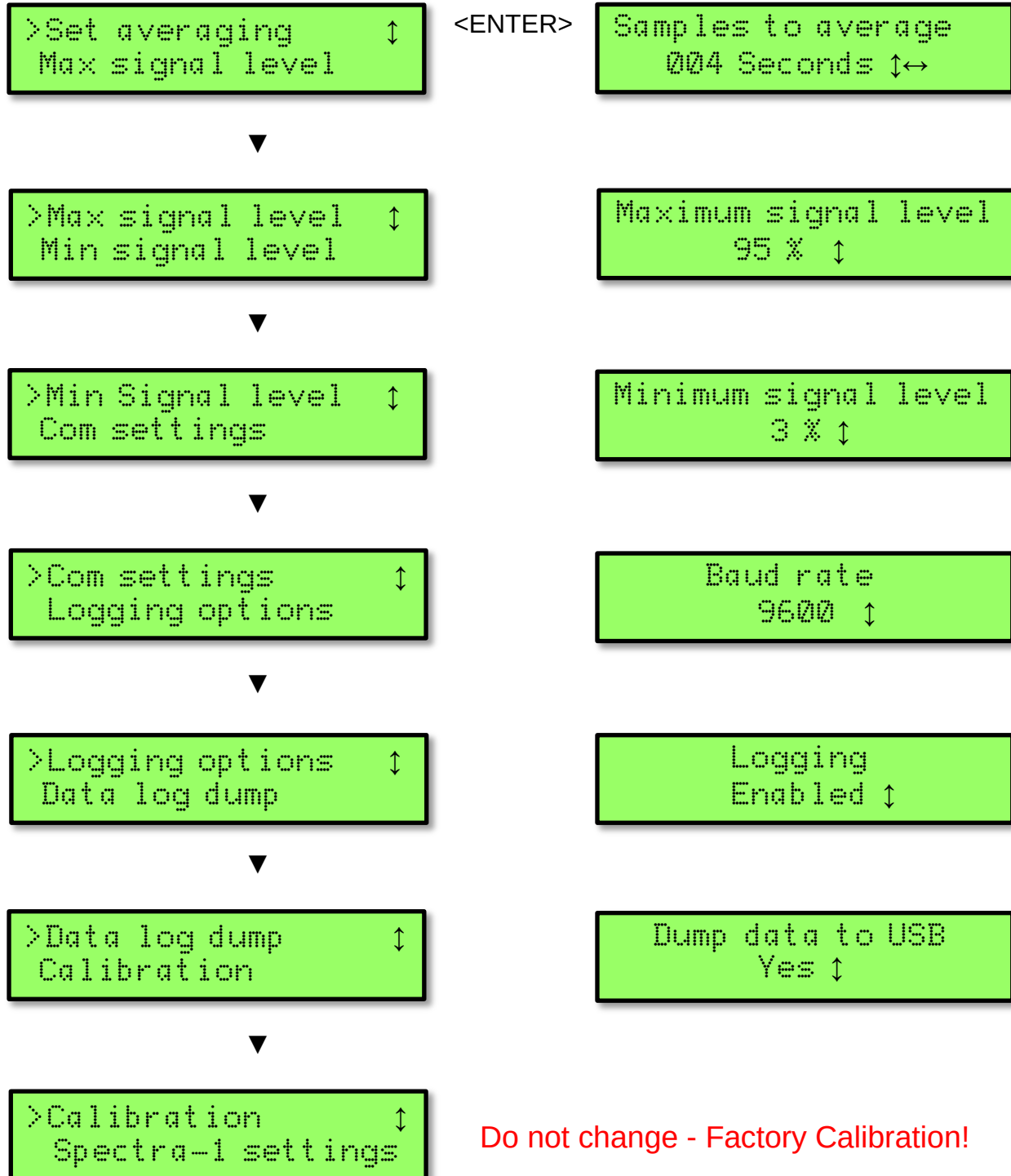
>Distance to refl. ↓
PPM or PPMM

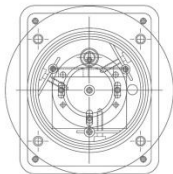
<ENTER>

Dist to reflector
250. [m] ↔

>PPM or PPMM ↑
Set Averaging

Units: PPM or PPMM
PPMM ↓





>Spectra-1 settings↓
Laser temperature

<ENTER>

Dump settings
No ↓

>Laser temperature ↓
Display IP address

Laser temperature
32.50 [C] ↓

>Display IP address↓
Periods to average

IP address is
Press any key

>Periods to average↓
Minimum r2 filter

Periods to average
080 sets ↑Δ~

>Minimum r2 filter ↓
Data log space

Min r2 value (0=off)
0.0 ↑

>Data log space ↓
Serial data debug

168MB currently
Press any key

>Serial data debug ↑

Dump data to serial
Disabled ↓



CONFIG/MENU Items Description:

Distance to refl.	- Distance between Spectra-1 and the retro-reflector
PPM or PPMM	- Change from PPM mode to PPM-M mode
Set averaging	- Set Spectra-1 averaging from 2 to 60 seconds
Max signal level	- Maximum signal level setting for data analysis
Min signal level	- Minimum signal level setting for data analysis
Com settings	- Baud rates: 2400, 9600, 19200, 38400, 57600, 115200, 230400
Logging options	- Enable or disable internal data logging (168MB allocated)
Data log dump	- Internally logged data transfer to USB memory stick
Calibration	- Do not change factory settings!
Spectra-1 settings	- Serial output of internal settings of Spectra-1
Laser Temperature	- Set laser diode temperature set point (future development)
Display IP address	- Display IP address when connected to Ethernet
Periods to average	- Internal sampling rate – Do not adjust!
Minimum r2 filter	- Filter to display data with a minimum r2 value
Data log space	- Internal data logging memory remaining
Serial data debug	- Serial data debug data string output via serial port(leave disabled)

Serial Data Output/Logging Format:

```
2007-03-12 11:37:14 MDT,0x00000001,NH3,0.46,0.00,ppmm,21%,5.0,11,0,0,0
2007-03-12 11:37:18 MDT,0x00000001,NH3,0.38,0.00,ppmm,21%,5.0,12,0,0,0
2007-03-12 11:37:22 MDT,0x00000001,NH3,0.41,0.00,ppmm,21%,5.0,11,0,0,0
2007-03-12 11:37:26 MDT,0x00000001,NH3,0.31,0.00,ppmm,21%,5.0,12,0,0,0
2007-03-12 11:37:30 MDT,0x00000001,NH3,0.35,0.00,ppmm,21%,5.0,11,0,0,0
```

Format is : t,s,g,r,p,w,P,T,d,c,e,l,h

t = time with time zone, 24 hour clock

s = status code – see below

g = gas species

r = averaged r-squared value

p = averaged gas concentration

w = ppm-m or ppm units

P = signal level %

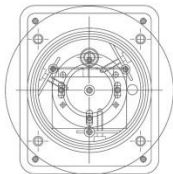
d = distance to retro-reflector (meters)

c = number of samples in averaging period

e = number of times we tried to get a sample set but did not

l = number of low signal level samples (also included in e)

h = number of high signal level samples (also included in e)



Status codes:

0x00000001 Normal Signal Present
0x00000002 No Signal Present
0x00000004 Low Signal Level
0x00000008 High Signal Level
0x00000010 Unstable Signal Level (Both High and Low Signal Levels)
0x00000020 Log File Full (Less than 10MB Free Space)

Power Connection:

Input power connection cable supplied:
C16-1 series Amphenol PN: T3109 081

Pin 1 : + 12VDC
Pin 2 : -

EARTH: Earth Shield: Internal connection to
Spectra-1 enclosure

CAUTION: Reverse polarity could
cause damage to Spectra-1



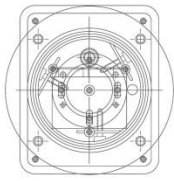


USB Data Download:

When internal logging is enabled, stored data may be downloaded to a USB memory stick for data analysis. A new data file is created for each 24 hr. period.

- Step 1: Insert USB memory stick 512 MB into USB port.
- Step 2: Press CONFIG/MENU key to enter Spectra-1 options menu list.
- Step 3: Scroll down to >Data log dump press ENTER key.
- Step 4: Dump data to USB – select Yes press ENTER key.
- Step 5: USB already inserted, press any key. data download starts.
- Step 6: After download complete press ENTER remove memory stick.





Serial Port Connection:

Connect serial port cable (DB-9 female-female) from RS232 output on Spectra-1 to com port on laptop or desktop computer.

A null modem cable is required.

In the case that there is no DB-9 serial port available, a USB serial adapter may be used. Plugable USB Serial Converter works well.

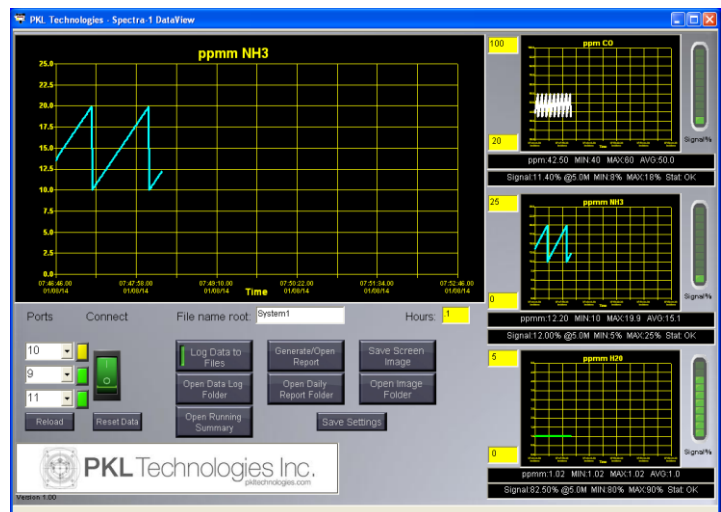
The serial port connection speed is set in the CONFIG/MENU set-up of Spectra-1. This is outlined in the Configuration Menu section.

Once connection is established Spectra-1 DataView or HyperTerminal may be used.

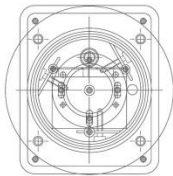
Data bits: 8
Parity: none
Stop bits: 1
Flow control: none



Plugable USB serial adapter



Spectra-1 DataView Program for Data display and logging



Chapter 3

Troubleshooting

Common Problems:

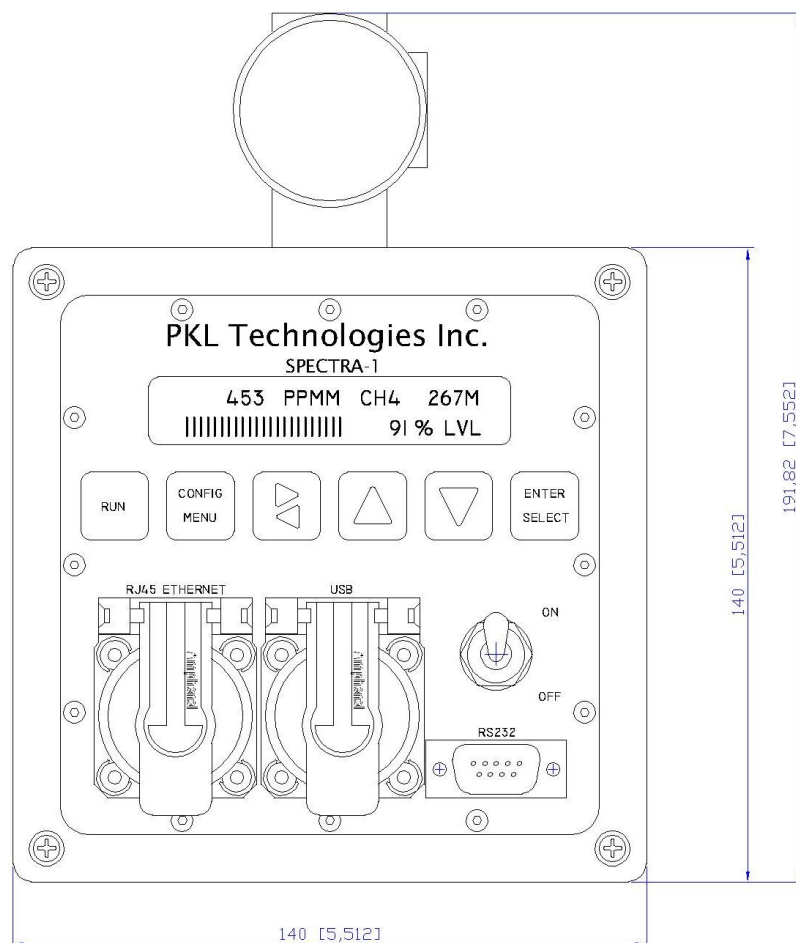
- **Power Connection**
Ensure +12VDC at Pin 1 of input power connector, Gnd connection at Pin 2.
- **Serial Port Communication**
Check baud rate setting, and correct DB-9 cable connection.
Check com port settings on laptop or desktop computer.
- **USB Data Download**
Ensure USB memory stick has adequate memory space available.
- **Low Signal Level**
Check for alignment with retro-reflector array.
Ensure Spectra-1 and retro-reflector windows are clean.
Verify IR laser output with IR sensor card. (Lumitek Model No. Q-32-R)
Check for clear obstruction free optical path.
Verify operation with reflective tape (red/white) at close range. (3 meters)
- **High Signal Level**
Remove retro-reflector elements to reduce signal level.
Rotate reflective tape with respect to Spectra-1 for short range use.
Red/white reflective tape for very short range - < 8 meters
Grey Reflexite for 8 to 25 meters – tilt or rotation of Reflexite tape may be required.
- **Stable Spectra-1 Mounting**
Ensure Spectra-1 and reflector are suitably mounted to eliminate alignment problems.
- Please consult with factory for any problems encountered. Your help will provide for a more extensive and detailed troubleshooting guide.



Chapter 4

Specifications

Spectra-1 Dimensions:





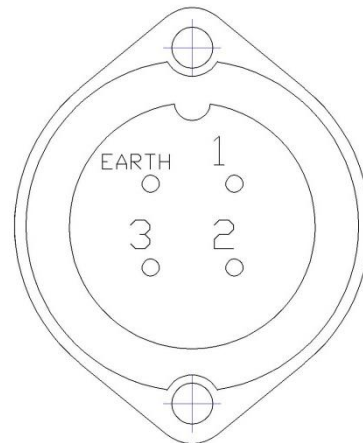
Power Input Pinout:

Pin 1: +12VDC

Pin 2: COMMON (Power Supply) or Battery -

EARTH: Earth Shield: Internal connection to Spectra-1 enclosure

POWER INPUT +12VDC 2A

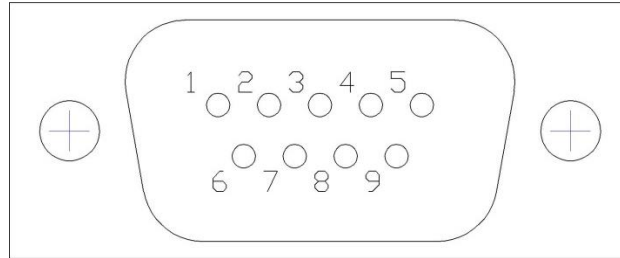




RS232 Serial Output (standard):

DB9 Male Connector

Pin 1: NC
Pin 2: Rx
Pin 3: Tx
Pin 4: NC
Pin 5: Ground
Pin 6: NC
Pin 7: NC
Pin 8: NC
Pin 9: NC



RS485 Serial Output (optional):

DB9 Male Connector

Pin 1: NC
Pin 2: TXD/RXD+
Pin 3: Ground
Pin 4: NC
Pin 5: Ground
Pin 6: NC
Pin 7: TXD/RXD-
Pin 8: NC
Pin 9: NC